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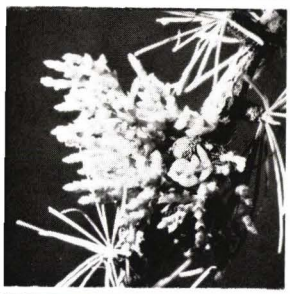

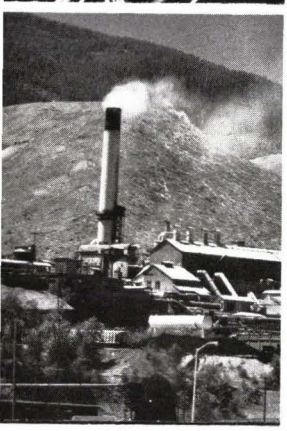

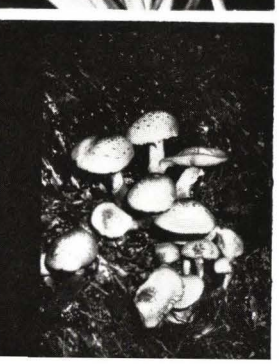

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EVALUATION OF PINE BUTTERFLY INFESTATIONS ON THE FLATHEAD INDIAN RESERVATION, MONTANA 1977

by

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and
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INTRODUCTION

The pine butterfly, *Neophasia menapia* (Felder and Felder), has been active within the confines of the Flathead Indian Reservation, Montana, since 1972 (Bousfield, 1972). Its primary host there has been ponderosa pine, *Pinus ponderosa* Laws. Light defoliation was first noticed on the National Bison Range in 1972. In following years light defoliation occurred in spots along the Mission Mountains from Pablo south to St. Ignatius.[1/] In late fall of 1976, patches of moderate defoliation containing some heavily defoliated trees were detected by Bureau of Indian Affairs (BIA) personnel in about 1,500 acres west of Big Arm in the Irvine I Logging Unit. At the request of BIA, personnel from the U.S. Forest Service, Forest Insect and Disease Management Staff, made an evaluation to determine potential damage in 1977.

On February 1, 1977, the authors accompanied by Steve Haglund and his assistant from BIA in Ronan made a biological evaluation of the infestation west of Big Arm and an older one in North Crow Creek Campground east of Pablo.

LIFE HISTORY AND HABITS

Adult butterflies are white with black wing markings and can be seen flying around the crowns of ponderosa pine in

1/ Ground observations by H. E. Meyer.

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August. Females lay light-green eggs in a single row along a needle. Most eggs are laid on needles near the end of a branch. The winter is spent in the egg stage. Eggs hatch when new needles first appear in the spring. Larvae are pale green and feed for 6 to 8 weeks. Usually only older needles are eaten, but epidemic populations consume old and new foliage. Mature larvae seek sites in bark crevices and on twigs, needles, and ground vegetation where they transform into pupae. Butterflies emerge 10 to 15 days after pupation. There is one generation a year (Cole 1961).

The pine butterfly can kill trees after several years of heavy defoliation. Weakened trees may be predisposed to attack by bark beetles (Cole 1961). Evenden (1940) reported radial growth reductions of over 70 percent due to defoliation. He observed reduced growth rates for up to 13 years following the outbreak.

METHODS

A sampling method described by Bousfield and Dewey (1972) was used to predict potential levels of defoliation in 1977 in areas infested by the pine butterfly. Predictions are based on the number of viable eggs per 5-inch branch sample and percentage of trees showing defoliation.

Four plots were sampled in the Irvine I Logging Unit (Figure 1) and one plot in North Crow Creek Campground. At each plot, six 5-inch branch tips were cut from midcrown with an extendable pole pruner from each of 10 pine trees to comprise a sample base of 60 branches. Twenty trees were examined for defoliation. Branch samples were brought back to Missoula and their foliage examined for eggs. Viable (green) eggs were counted and the average number per 5-inch branch determined. Nonviable eggs, which are whitish and dry inside, were not counted.

The regression equation used by Bousfield and Dewey (1972) to predict defoliation is: $Y = -.0659 + .0141(X_1) + .02(X_2)$, where:

Y = defoliation index

X_1 = mean number of eggs per 5-inch branch

X_2 = percent of trees with visible defoliation

Defoliation indexes can be converted to percent defoliation as follows:

Defoliation index	Range of predicted defoliation (percent)	Category
0	0-11	Negligible
1	12-37	Light
2	38-62	Moderate
3	63-85	Heavy
4	86-100	Severe

RESULTS AND DISCUSSION

In the Irvine I Logging Unit, defoliation is predicted to be moderate on plots 1,3, and 4 and light on plot 2 in 1977 (Fig. 1) (Table 1). In general, defoliation is expected to remain at about the 1976 level; i.e., it will probably be light to moderate throughout the infested area. Some trees, especially dominant, overmature ones, were heavily defoliated (all old and many new needles consumed) in 1976. Many smaller trees had all their old needles consumed leaving only the 1976 growth.

Continued defoliation in 1977 plus possible drought conditions may cause mortality among the overmature, high-risk (Keen's classification) ponderosa pine trees that were heavily defoliated in 1976. If they are not killed by the defoliation, stressed trees may become susceptible to bark beetle attack.

Defoliation was hard to detect in North Crow Creek Campground. Based on egg counts, defoliation is predicted to be light in 1977 (Table 1). This infestation is decreasing.

Table 1.--Potential defoliation by the pine butterfly on the Flathead Indian Reservation in 1977.

Plot	Avg. No. eggs per 5-inch branch	Trees showing defoliation (percent)	Defoliation index	Predicted defoliation in 1977 (percent)
1	10.3	100	2.2	54
2	14.1	50	1.3	32
3	5.4	100	2.1	51
4	7.9	100	2.2	54
N.Crow Creek	.3	20	.5	12

RECOMMENDATIONS

Based on the evaluation, it is recommended that merchantable, high-risk ponderosa pine trees that were heavily defoliated in 1976 in the Irvine I Logging Unit be harvested during present logging operations. This recommendation is based on the assumptions that: (1) additional moderate defoliation will occur, and (2) a drought may develop in 1977. Under these conditions, there is a high probability that these trees will be killed in 1977 either directly by the pine butterfly, or predisposed to attack by bark beetles. If these assumptions are not met, it is the authors' opinion that these trees could survive for an extended period.

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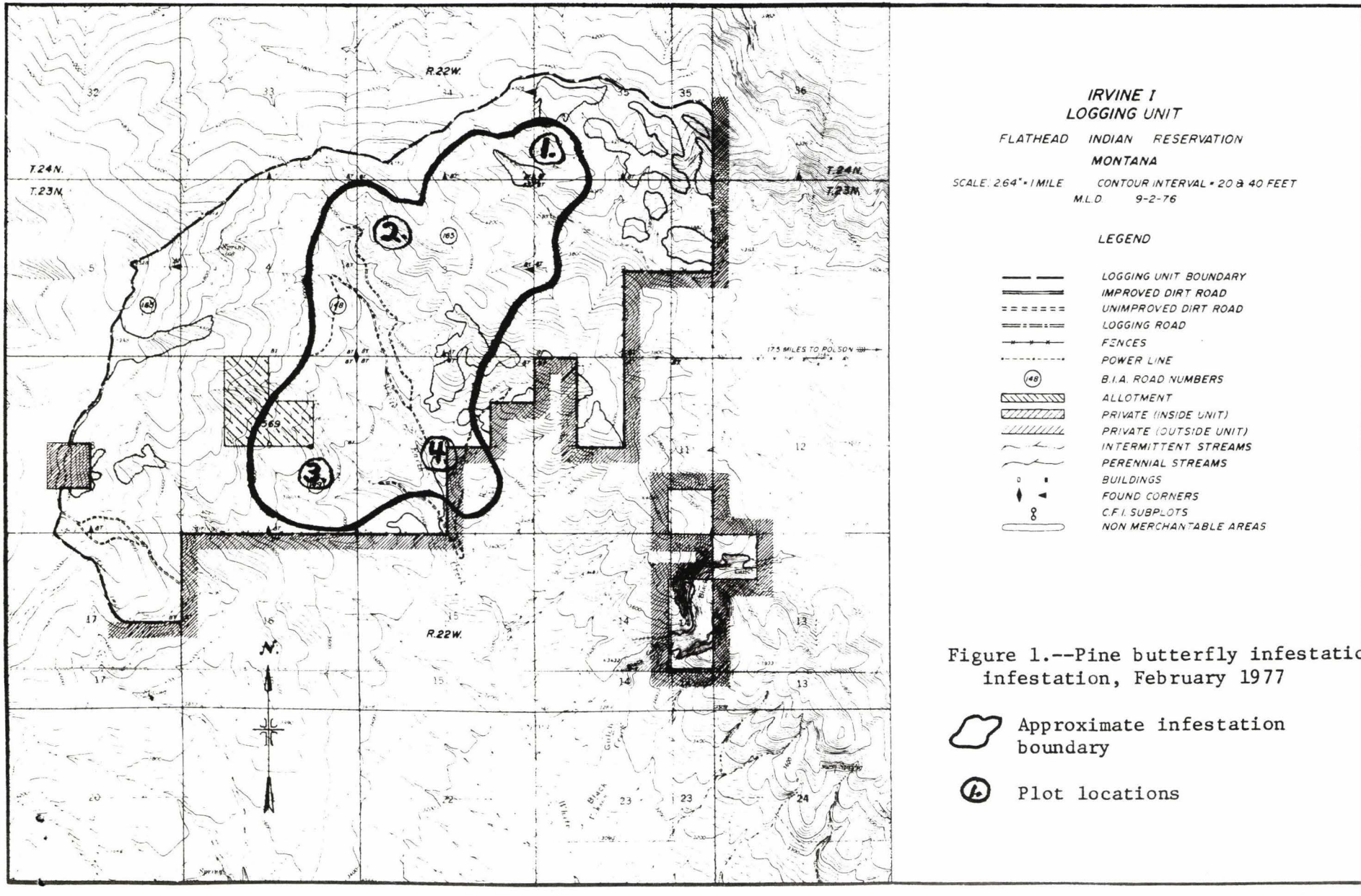

Figure 1.--Pine butterfly infestation infestation, February 1977

Approximate infestation boundary

Plot locations